Island-mode Enhancement Strategies and Methodologies for Defense Critical Infrastructure

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The official link for this solicitation is:
http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml

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Description:

The defense critical infrastructure (DCI) is the composite of DoD and non-DoD assets essential to project, support, and sustain military forces and operations worldwide. The DCI includes, but is not limited to, elements such as military bases, ballistic missile defense installations, radar sites, etc. An electromagnetic (EM) attack (nuclear electromagnetic pulse [EMP] or non-nuclear EMP [e.g., high-power microwave, HPM]) has the potential to degrade or shut down portions of the electric power grid important to the DoD. While a power grid may employ intentional islanding techniques to protect sections of the grid and prevent a cascading collapse of the power grid, the broad reach of potential EM attacks with the potential of simultaneous levels of disruption might prevent traditional islanding protection methods from being sufficient for continued operations of the DCI. Restoring the commercial grid from the still functioning regions may not be possible or could take weeks or months. Significant elements of the DCI require uninterrupted power for prolonged periods to perform time-critical missions (e.g., sites hardened to MIL-STD-188-125-1). To ensure these continued operations, DCI sites must be able to function as a microgrid that can operate in both grid-connected and intentional island-mode (grid-isolated). Such a microgrid is defined as a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the power grid. The purpose of this topic is, through systematic study of a typical DCI site, to develop enhanced methodologies and technologies

for providing intentional island-mode capability at DCI sites in the event of grid loss. Methodologies should account for the need of immediate and continuous operations at sites and the seamless transition to and from commercial power (grid-connected and grid isolated states). The emphasis of this project should be on determining how to best prepare an existing DoD site for intentional island-mode operation and identifying major risks and hurdles. This work will require refinement of existing technologies and development of new technologies and is directed specifically toward applying the new knowledge to meet the survivability of DoD sites to EM attacks affecting large geographical areas. The goal of this project is to develop a set of methodologies and strategies that can be applied, along with existing methods, to enhance the resilience of DCI assets such as military bases. Such methods should aide in the development of islanding at DoD sites to ensure survivability to geographically large EM threats. These methods may also be applied to the commercial sector and other areas of the government: hospitals, civilian infrastructure, businesses, etc. PHASE I: The successful Phase I project should develop innovative strategies and methodologies for DCI island-mode operations in the event of power grid disruption or failure due to an EM threat. Sufficient detail should be developed to show technical competency and/or proof of concept. Phase I strategies as well as establishing performance goals. Additionally, a draft roadmap should be developed indicating Phase II and Phase III plans, timelines, and addressing key decision points and milestones. PHASE II: Phase II will focus on intentional island-mode methodologies and strategies at a specific DCI site (TBD). Limited initial testing may occur at a proto-type site, via modeling, or prior to full scale testing at a DCI site. Identify and address key island-mode hurdles, limitations, and obstacles and provide recommendations on addressing these areas. Methodologies and strategies should be improved and expanded based on testing, assessments, and available date. Clear documentation on strategies/methodologies and improvements is a priority. Identification of dual use commercial applications is an important aspect of this phase. PHASE III: The Phase III project would focus execution of the Phase II test plan and on expanding these methodologies and strategies to include systems/infrastructure outside the DCI. This could include other DoD/government agency sites, hospitals, civilian infrastructure, or other commercial sites. Methodologies developed for the site specific work in Phase II could be expanded for a different site or generalized to create overarching guidelines.